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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/563,087	12/30/2005	Keiji Sumiya	1303.45694X00	8128

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ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-3873

EXAMINER	
MALEKZADEH, SEYED MASOUD	

ART UNIT	PAPER NUMBER
1722	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No.	Applicant(s)	
	10/563,087	SUMIYA ET AL.	
	Examiner	**Art Unit**	
	SEYED MASOUD MALEKZADEH	1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

An initialed and dated copy of Applicant's IDS form 1449 filed on 02/10/ 2006, is attached to the instant Office action.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-3 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 is vague and indefinite because it is unclear about the surface roughness measurement by indicating "Rmax 6.4s".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 3-4, 9-12, and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawase et al (US 5,830,269) in view of Obara et al. (US 2003/0089299)

Kawase et al ('269) teaches a crucible characterized in that the surface roughness of the inner surface of the crucible as measured by the maximum height method and Rmax is between 10 μm to 150 μm. Kawase et al ('269) further teaches the crucible is used for growth of II-VI or III-V compound single crystal along the crystal plane of a seed by melting and cooling of a polycrystalline group II-VI or III-V compounds (lines 33-44, column 3).

Further, Kawase et al. teaches the group II-VI or III-V compound single crystal prepared is used for various optoelectronic devices. (See lines 64-67, column 1)

Kawase et al ('269) further discloses a crucible characterized in that a tapered cone surface is formed between the starting material carrying section in which the starting material of polycrystalline compound is loaded and the seed carrying section in

which said seed is loaded, (See lines 1-8 column 9, lines 24-33, column 13 and figures 3-5), the wall surface of said starting material carrying section is smoothly connected to the cone surface via a concave curved plane, and said cone surface is smoothly connected to the wall surface of the seed carrying section via a convex curved plane (See lines 1-8 column 9, lines 24-33 column 13, Figures 3-5).

Kawase et al ('269) further teaches a starting material carrying section in which the starting material is loaded, and a seed carrying section in which said seed is loaded, wherein the bottom of seed carrying section has a shape matching the edge of said seed. (See lines 45-59, column 6; lines 5-19, column 15; and Figures 6-8)

Kawase et al ('269) further teaches a crucible wherein the edge of the seed has an edge face and a side connected to the edge face, while the bottom of the seed carrying section has a bottom face and a wall surface which is connected to the bottom face and matches the side of the seed, wherein both the edge face and the bottom face are flat surfaces. (See lines 55-56, column 6; lines 5-19, column 15; lines 1-8, column 9; and Figures 6-8)

However, Kawase et al ('269) does not teach the optical part material such as calcium fluoride as a starting material for melting and cooling in the crucible, and further Kawase et al ('269) does not teach the crucible is composed of carbon.

In the analogous art, Obara et al. (US 2003/0089299) teaches heating of an optical member made of fluoride crystalline materials such as calcium fluoride in a crucible to melt the fluoride powder mixture and crystallize the fluoride crystalline

material (See Paragraph [0069]). Furthermore, Obara et al ('299) teaches the crucible is made of carbon. (See paragraph [0093]).

Therefore, It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify Kawase et al ('269) to include an optical part material such as calcium fluoride for the melting and cooling in the crucible in order to reduce birefringence induced by thermal stresses generated by melting and cooling of optical material in the crucible, and further include a carbon made crucible for the growth of a single crystal, as suggested by Obara et al. ('299) in order to achieve high UV transmission values and a good quality for optical materials.

Further, claim 12 is drawn to a method and combination of Kawase et al. ('269) in view of Obara et al. ('299) teach a method of single crystal growth method as follows,

Kawase et al. ('269) teaches a group II-VI or III-V compound single crystal growth method whereby a single crystal is grown using a crucible, characterized by comprising a seed loading step in which a seed having an edge with a shape matching the bottom of seed carrying section is loaded as the seed in seed carrying section of said crucible, a starting material loading step in which the polycrystalline material is loaded as the starting material in said starting material carrying section, and a growth step in which a single crystal of the polycrystalline material is grown along the crystal plane of said seed by melting and cooling (See lines 45-65, column 3; lines 10-19, column 15).

However, Kawase et al. ('269) does not teach a single crystal of an optical part material such as calcium fluoride is grown in the crucible by the single crystal growth method.

In the analogous art, Obara et al. (US 2003/0089299) teaches a method of manufacturing an optical member made of fluoride crystalline materials such as calcium flouride by using a crucible to heat and melt the fluoride powder mixture and crystallize the fluoride crystalline material (See Paragraph [0027], [0028], and [0065])).

Therefore, It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify Kawase et al. ('269) to grow a single crystal of an optical part material such as calcium fluoride in the crucible in order to reduce birefringence induced by thermal stresses generated by melting and cooling of optical material in the crucible, as suggested by Obara et al. ('299)

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawase et al (US 5,830,269) in view of Obara et al. (US 2003/0089299) as applied to claims 1 and 3-4 and 9-11, and further in view of Lewis et al (US 5,476,679)

Kawase et al ('269) and Obara et al. ('299) teach all the claim limitations of a crucible fo rthe growth of a single crystal of an optical part material as discussed above. However, Kawase et al ('269) and Obara et al. ('299) do not teach the inner surface of the crucible is composed of a glassy glass-like carbon.

In the analogous art, Lewis et al. ('679) teaches a crucible, which is made by carbon component such as graphite. Lewis et al. ('679)further teaches crucible has an outer layer of glassy carbon material (See lines 14-20, column 1). Lewis et al. ('679) further teaches the advantages of using a crucible with an outer layer of glassy carbon material. (See lines 26-30, column 3)

Therefore, It would have been obvious for an ordinary skill in the art to modify Kawase et al ('269) and Obara et al. ('299) to compose crucible inner surface with a glass-like carbon in order to prevent from the contamination of the melt inside of the crucible with impurities, as suggested by Lewis et al. ('679)

Claims 5 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable by Ejim (US 4,946,544) in view of Obara et al. (US 2003/0089299).

Ejim ('544) teaches a crucible for growth of a single crystal along the crystal plane of a seed by melting and cooling group III-V material (See lines 44-68 column 2 and lines 1-29 column 3) characterized in that the cone angle of the tapered cone surface formed between the starting material carrying section in which the starting material of group III-V material is loaded and the seed carrying section in which the seed is loaded in an angle of 120°. (See lines 58-68 column 4 and lines 1-10 column 5, Figure 1)

However, Ejim ('544) does not teach the optical part material such as calcium fluoride as a starting material for melting and cooling in the crucible.

In the analogous art, Obara et al. ('299) teaches an optical members made of fluoride crystalline materials such as calcium flouride by using a crucible to heat and melt the fluoride powder mixture and crystallize the fluoride crystalline material (See Paragraph [0069])). Furthermore, Obara et al ('299) teaches crucible was made of carbon. (See paragraph [0093]).

Therefore, It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify Ejim ('544) to include an optical part material

such as calcium fluoride for the melting and cooling in the crucible in order to reduce birefringence induced by thermal stresses generated by melting and cooling of optical material in the crucible, as suggested by Obara et al. ('299).

Claims 6, 8, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Young et al. (US 5,169,486) in view of Obara et al. (US 2003/0089299)

Young et al ('486) teaches a crucible for growth of a single crystal along the crystal plane of a seed by melting and cooling a starting material, characterized in that the contact angle between the crucible inner surface and water droplets is no greater than 100 degree. (See figures 2 and 3, lines 21-38 and lines 47-51, column 4)

However, Young et al ('486) does not teach the optical part material such as calcium fluoride as a starting material for melting and cooling in the crucible, and further Young et al ('486) does not teach the crucible is composed of carbon.

In the analogous art, Obara et al. (US 2003/0089299) teaches an optical members made of fluoride crystalline materials such as calcium flouride by using a crucible to heat and melt the fluoride powder mixture and crystallize the fluoride crystalline material (See Paragraph [0069])). Furthermore, Obara et al ('299) teaches crucible was made of carbon. (See paragraph [0093]).

Therefore, It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify Young et al ('486) to include an optical part material such as calcium fluoride for the melting and cooling in the crucible in order to reduce birefringence induced by thermal stresses generated by melting and cooling of optical material in the crucible, and further include a carbon made crucible for the

growth of a single crystal, as suggested by Obara et al. ('299) in order to achieve high UV transmission values and a good quality for optical materials.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Young et al ('486) in view of Obara et al. ('299) as applied to claims 6, 8, and 23 and further in view of Lewis et al (US 5,476,679)

Young et al ('486) and Obara et al. ('299) teach all the claim limitations of a crucible for the growth of a single crystal of an optical part material as discussed above. However, Young et al ('486) and Obara et al. ('299) do not teach the inner surface of the crucible is composed of a glassy glass-like carbon.

In the analogous art, Lewis et al. ('679) teaches a crucible, which is made by carbon component such as graphite. Lewis et al. ('679) further teaches crucible has an outer layer of glassy carbon material (See lines 14-20, column 1). Lewis et al. ('679) further teaches the advantages of using a crucible with an outer layer of glassy carbon material. (See lines 26-30, column 3)

Therefore, It would have been obvious for an ordinary skill in the art to modify Young et al ('486) and Obara et al. ('299) to compose the crucible inner surface with a glass-like carbon in order to prevent from the contamination of the melt inside of the crucible with impurities, as suggested by Lewis et al. ('679)

Claims 13-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawase et al. ('269) in view of Obara et al. ('299) as applied to claims 1, 3-4, 9-12, and 20-21, and further in view of Young et al. ('486)

Kawase et al. ('269) in view of Obara et al. ('299) teach all the claim limitations of a crucible for growth of a single crystal of an optical part material as discussed above. Kawase et al. ('269) further teaches a closed-bottom seed carrying section extending in the vertical direction, in which a seed is loaded, Kawase et al. ('269) also teaches a starting material carrying section in which polycrystalline material is loaded, which is situated above said seed carrying section and is connected to said seed carrying section. (See lines 45-56, column 6 and figures 6-8)

However, Kawase et al. ('269) does not teach using thermocouples in order to detect internal temperature of seed carrying section, and also does not teach said thermocouples are situated at a position near the wall surface of said seed carrying section.

In the analogous art, Young et al. (486) teaches a crucible for growth of a single crystal wherein temperature of seed carrying section inside of the crucible is detected by a plurality of thermocouples which are situated at a position near the wall surface of seed carrying section, and the plurality of thermocouples are situated at mutually separated positions in the vertical direction. (See lines 41-62 column 2 and lines 12-20 column 4, and figure 1). Young et al. (486) further teaches one of thermocouples is situated at a position at a height above the bottom end of said seed carrying section corresponding to 25-50% of the depth of said seed carrying section, while the other is situated at a position at a height above the bottom end of said seed carrying section corresponding to 60-80% of the depth of said seed carrying section. (Figure 1)

It would have obvious for one of ordinary skill in the art to at the time of applicant's invention to modify Kawase et al. ('269) in view of Obara et al. ('299) by using thermocouples to detect temperature of the seed carrying section in order to control the crystal growth direction in the crucible, as suggested by Young et al (486).

Further, claims 18 and 19 are drawn to a method and combination of Kawase et al. ('269) in view of Obara et al. ('299) and further in view of Young et al. (486) teach a method of single crystal growth method as follows,

Kawase et al. ('269) and Obara et al. ('299) teach all the claim limitations of a method for growing a single crystal as discussed for claim 12. Kawase et al. ('269) further teaches a step of loading the starting material into the crucible (See lines 47-57, column 3), and a growth step in which group II-VI or III-V compound single crystal is grown along the crystal plane of the seed by melting and cooling starting material in the crucible. (See lines 35-44 and lines 45-59, column 3) Kawase et al. ('269) teaches a step of situating crucible in a crystal growth furnace heated in such a manner that the interior has a specified temperature gradient in the vertical direction, and heating said crucible so that the starting material carried in the starting material carrying section and the seed carried in the seed carrying section gradually melt form top to bottom (See lines 45-67, column 3).

However, Kawase et al. ('269) and Obara et al. ('299) do not teach the step of detecting the internal temperature of the seed carrying section during heating of the crucible and also the step of terminating the heating and commencing the cooling for growth of a single crystal when based on the internal temperature of the seed carrying

section detected by temperature means. Further, Kawase et al. ('269) also does not teach the position of thermocouples in the crucible.

In the analogous art, Young et al. (486) teaches a method for growth of a single crystal by a crucible wherein the internal temperature of the seed carrying section detected during heating of crucible (See lines 41-62 column 2 and lines 12-20 column 4, and figure 1). Young et al. (486) further teaches a step of terminating the heating and commencing the cooling for growth of a single crystal when based on the internal temperature of the seed carrying section detected by the temperature detecting means, the boundary position between the melted portion and unmelted portion of the seed carried in the seed carrying section is judged to be between a first position which is at a prescribed height above the bottom end of the seed carrying section and a second position which is at a prescribed height above the first position. (See lines 8-65 column 3). Young et al. (486) further teaches one of the two thermocouples is situated at a position at a height above the bottom end of the seed carrying section corresponding to 25-50% of the depth of the seed carrying section, while the other is situated at a position at a height above the bottom end of the seed carrying section corresponding to 60-80% of the depth of the seed carrying section. (See lines 47-62 column 2 and Figure 1)

It would have obvious for one of ordinary skill in the art to at the time of applicant's invention to modify Kawase et al ('269) and Obara et al ('299) by detecting a temperature of the seed carrying section by thermocouples and determining the position

of thermocouples inside of the crucible in order to control crystal growth direction in the crucible, as suggested by Young et al (486).

Remarks

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Masoud Malekzadeh whose telephone number is 571-272-6215. The examiner can normally be reached on Monday – Friday at 8:30 am – 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra N. Gupta can be reached on (571) 272-1316. The fax number for the organization where this application or proceeding is assigned is 571-272-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance form a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SMM

ROBERT KUNEMUND
PRIMARY EXAMINER